REMARKS

Reconsideration of the Office Action dated March 14, 2006 is respectfully requested. Claims 1 – 5, 7 – 9, 18 – 22, 27 and 28 have been examined. Claims 1, 2, 7 – 9, 18, 20 – 22, 27, and 28 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pat. No. 5,085,562 ("van Lintel"); Claims 1 – 5, 7 – 9, 18, 20 – 22, 27, and 28 stand rejected under 35 U.S.C. §102(b) as anticipated by Microfluidics—a review ("Gravesen"); Claims 1, 2, 7 – 9, 18, 20 – 22, 27, and 28 stand rejected under 35 U.S.C. §102(b) as anticipated by Smallest Dead Volume Microvalves for Integrated Chemical Analyzing Systems ("Shoji"); and Claims 1 – 5, 7 – 9, 18, 20 – 22, 27, and 28 stand rejected under 35 U.S.C. §102(b) as anticipated by Modular Concept for Fluid Handling Systems ("Lammerink").

Applicants' claimed invention describes a microfluidic device and method for using the microfluidic device wherein the device comprises a flow channel, pump, and a damper for reducing the fluid oscillation within the flow channel. As taught in Applicants' specification, such a device is particularly useful and necessary for applications, such as cell sorting, where fluid flow fluctuations have a significant deleterious effect. To overcome this drawback in sensitive applications, Applicants have invented systems with dampers that effectively reduce fluctuations in these microfluidic-scale systems. None of the references cited by the Office Action teach or suggest such damped microfluidic devices. Accordingly, none of the cited references anticipate or make obvious pending claims 1-5, 7-9, 18-22, 27 and 28. Additionally, Applicants' claims 2 – 5 describe a device with a flow control valve in addition to any valve that is construed to be a part of a pump. None of the references in the Office Action teach or suggest such a flow control valve that is operatively interconnected to the flow channel.

Applicants' new claims 34 – 41 further define Applicants' inventions by specifying that the flow channel is formed in an elastomer material. Each of the cited references describe microfluidic structures defined by non-elastomeric materials and thus, in addition to their failure to disclose dampers, neither teach or suggest the fabrication of a flow channel

formed in an elastomer material that form the microfluidic pump-flow channel-damper systems of claims 34-41. Support for new claims 34-41 is found, for example, in the embodiments described on page 3 of Applicants' specification as well as throughout the specification. New claims 42 – 45 recite a damper having a separate "encapsulated pocket of compressible fluid" to emphasize that the cavity that contains the encapsulated fluid pocket is never in fluidic communication with the flow channel. Support for these amendments is provided in the application at, *e.g.*, p. 38, ll. 30 – 32 and p. 39, ll. 24 – 26, as illustrated in Fig. 26.

U.S. Patent 5,085,562, issued to van Lintel, discloses a piezoelectric wafer driven pump system utilizing a pumping chamber and an outlet valve. The pump chamber and the outlet valve chamber are etched from a silicon wafer and sandwiched between glass plates. The machined plates that form the pump and the structures that form the valves, while disclosing a microfluidic pump, are not dampers and there is no discussion within van Lintel about the need for dampening or the methods by which damper structures can be fabricated. The pumps and valves disclosed by van Lintel will generate pulsatile flow and do not accommodate the problems inherent to pulsatile flow. Claims 1, 2, 7 – 9, 18, 20 – 22, 27, and 28 are therefore neither anticipated nor suggested by van Lintel or by van Lintel in combination with the other references.

The flow channels disclosed in van Lintel are defined by non-elastomeric substrates and therefore do not anticipate Applicants' original claims 18, 20 – 22 or Applicants' new claims 34 – 41. Moreover, there is no suggestion of the use of a flow channel formed in an elastomer material or discussion of how such elastomeric channels could be formed. Accordingly, van Lintel, either alone or in combination, does not anticipate or make obvious original claims 18, 20 – 22, 27 and 28 or new claims 34 – 41.

Claim 2 and new claims 35 – 38 describe a microfluidic device with a flow control valve in addition to any valve that is construed to be a part of a pump. The van Lintel patent only describes valving that is part of the pump apparatus and thus does not anticipate or make obvious claims 2 and 35 – 38.

New claims 42 – 45 recite a damper having a separate encapsulated pocket of compressible fluid. Such a feature is neither anticipated or made obvious by van Lintel or by van Lintel in combination with the other references.

Gravesen discloses various microfluidic pumping systems but does not describe a damper structure as claimed by Applicants. Moreover, there is no teaching in Gravesen about the need for a damper structure and Gravesen provides no motivation for the inclusion of such a structure. Contrary to the assertion in the Office Action, Gravesen does not disclose a damper comprising a cavity separated from the flow channel by a flexible membrane. Gravesen does disclose a flexible membrane that forms a microfluidic pump (page 177, figure 13) but this flexible membrane is solely used as part of the pump structure and is not disclosed or suggested to perform a dampening function. It would also be unusual and perhaps impossible for the active membrane of the pump in figure 13 to also function separately as a damper. Figure 14 of Gravesen shows a microfluidic pump in a structure with two 3-way valves but does not disclose a damper. There is no information about the structure of the materials of the device of Figure 14 other that the figure legend indicating pyrex glass and silicon fabrication. Thus there is no teaching or suggestion of Applicants' claimed microfluidic structure comprising a flow channel; a pump operatively interconnected to said flow channel for moving a fluid in said flow channel; and a damper operatively interconnected to said flow channel. Neither is there any teaching of dampers associated with a channel formed in an elastomer material. Accordingly, claims 1 – 5, 7 – 9, 18, 20 – 22, 27, and 28 and new claims 34 – 41 are neither anticipated or made obvious by Gravesen either alone or in combination with the other references.

New claims 42 – 45 recite a damper having a separate encapsulated pocket of compressible fluid. Such a feature is neither anticipated or made obvious by Gravesen or by Grevesen in combination with the other references.

Shoji et al., solely teaches microvalves for fluidic systems not the microfluidic device claimed by the Applicants. Shoji does show a polymer membrane as part of the valve structure in figures 1 – 4 but does not show or suggest how such a membrane could function as a

damper. Indeed the exact opposite function is taught. By the opening or closing of the microvalves disclosed by Shoji, pulsations or extreme fluctuations would be *introduced* into a microfluidic flow stream.

Shoji also fails to disclose channel formed in an elastomer material which are elements of Applicants' claims 18, 20 – 22, 27, and 28 and new claims 34 – 41. As noted above, Shoji does not disclose or suggest the pumping and dampening features of Applicants' claimed microfluidic device and therefore does not anticipate or make obvious, either alone or in combination with other references, claims 1 – 5, 7 – 9, 18, 20 – 22, 27, and 28 or new claims 34 – 41.

New claims 42 – 45 recite a damper having a separate encapsulated pocket of compressible fluid. Such a feature is neither anticipated or made obvious by Shoji or by Shoji in combination with the other references.

The Lammerink et al., reference discloses microfluidic pumping and sensor systems. There is no teaching or suggestion in Lammerink of dampers for such systems or any acknowledgement of the need for dampers in such systems. Figure 7 of Lammerink is basically the identical pump structure of figure 13 in the Gravesen reference (minus the flow sensor in Gravesen) and fails to disclose or suggest Applicants' claimed invention for the same reasons as discussed above relating to the Gravesen reference. In short, in Lammerink as in Gravesen, the pump is a pump and not a damper. Applicants' claimed invention describes a microfluidic device and method for using the microfluidic device wherein the device comprises a flow channel, pump, and a damper for reducing the fluid oscillation within the flow channel. The omission of even the concept of dampening is apparent in Lammerink where figure 13 shows simulated pump flows without any evidence of damping. The structures described by Lammerink are fabricated by glass-silicon sandwiches or by plastics and do not disclose channel formed in an elastomer material as recited in Applicants' claims 18, 20 – 22, 27, and 28 and new claims 34-41.

As discussed above, the Lammerink reference does not disclose, contemplate, or suggest Applicants' claimed microfluidic device. It does not disclose, contemplate, or suggest

channel formed in an elastomer material as described in claims 18, 20 – 22, 27, and 28 and new claims 34-41. Accordingly, Lammerink, alone or in combination, does not anticipate or make obvious pending claims 1 – 5, 7 – 9, 18, 20 – 22, 27, and 28 or new claims 34 – 41.

Claims 2 – 5 and new claims 35 – 38 describe a microfluidic device with a flow control valve in addition to any valve that is construed to be a part of a pump. Lammerink only describes valving that is part of the pump apparatus and thus does not anticipate or make obvious claims 2 – 5 and 35 – 38.

New claims 42 – 45 recite a damper having a separate encapsulated pocket of compressible fluid. Such a feature is neither anticipated or made obvious by Lammerink or by Lammerink in combination with the other references.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,

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